

WHAT IS CLAIMED IS:

1. A communication system which comprises a mobile station operable in accordance with a predetermined mobile communication protocol and an internet protocol (IP) terminal operable in accordance with an IP, the predetermined mobile communication protocol allowing to use a plurality of radio links between the mobile station and the IP terminal, the mobile station being communicable with the IP terminal, the communication system comprising an interworking apparatus which is operable in response to an IP frame defined by the IP and a plurality of radio frames defined by the predetermined mobile communication protocol,

the interworking apparatus comprising:

framing means for framing each IP frame into PPP frames defined by the PPP;

transmitting frame memory means which are assigned to the radio links, respectively, for storing the PPP frames one by one, respectively; and

transmitting means for transmitting the stored PPP frames through the plurality of the radio links in the form of the radio frames, respectively.

2. A communication system as claimed in claim 1, wherein the predetermined mobile communication protocol is a radio link protocol (RLP) type 2 defined by the TIA/EIA/IS-707A; and wherein:

the transmitting means comprises:

converting means for converting the PPP frames stored in the frame memories into a plurality of radio link protocol (RLP) frames defined by the RLP type 2; and

radio frame memory means which are made to correspond to the radio links, respectively, for individually storing each of the RLP frames to make the transmitting means transmit each RLP frame as each of the radio frames.

3. A communication system as claimed in claim 2, wherein the interworking apparatus further comprises:

receiving means for receiving the plurality of the radio frames through the plurality of the radio links, respectively;

reception frame memory means for individually storing the radio frames at every one of the radio frames; and

reproducing means for reproducing the radio frames into corresponding PPP frames.

4. A communication system as claimed in claim 3, wherein the interworking apparatus further comprises:

sending means for sending the PPP frames to the IP terminal after the PPP frames are converted into IP frames, when the reproduced PPP frames are IP frames.

5. A communication system as claimed in claim 4, wherein the transmitting frame memory means comprises:

a plurality of frame memories which are equal in number to the radio links assigned to the interworking apparatus;

the interworking apparatus further comprising:

reception frame control means for assigning the PPP frames sent from the framing means to the respective frame memories; and

transmission frame control means for successively reading the radio frames out of the reception frame memory means.

6. A communication system as claimed in claim 5, wherein the number of the plurality of the frame memories of the transmitting frame memory means is changed with reference to the number of the radio

links.

7. An interworking apparatus located between a mobile station and an IP terminal so as to carry out mutual conversion between Digital cellular method and the IP protocol, the mobile station being operable in accordance with both the Digital cellular method and the IP protocol while the IP terminal is operable in accordance with the IP protocol, comprising:

an IP protocol interface for executing interface processing of the IP protocol to produce IP frames;

a radio protocol interface for executing interface processing of a radio protocol to produce radio frames;

a framing portion responsive to the IP frames, for framing the IP frames into PPP frames;

a reception frame control portion for assigning the respective IP frames at every one of radio links;

PPP frame memory means for individually storing the PPP frames at every one of the radio links determined in number under control of the reception frame control portion;

RLP converting means for converting the PPP frames stored in the frame memories into RLP frames equal in number to the PPP frames;

frame transmitting means which are made to correspond to the RLP converting means for transmitting the RLP frames through the radio interface to a radio transmission path;

radio reception means for receiving, through the radio interface, RLP frames sent from the radio links determined in number;

RLP frame memory means, the number of which is determined in accordance with the radio links, for successively storing each of the RLP frames;

a transmission frame control portion for successively reading the RLP frames out of the RLP frame memory means;

reproducing means for reproducing the RLP frames read out of the RLP frame memory means into corresponding PPP frames, to convert the PPP frames into the IP packets on detection of the IP frame.

8. An interworking apparatus as claimed in claim 7, the mobile station negotiating with the radio interface prior to communication with the interworking apparatus, in connection with the number of the radio links in a forward direction from the interworking apparatus to the mobile station and in a reverse direction from the mobile station to the interworking apparatus,

wherein the radio interface informs the reception frame control portion and the transmission frame control portion of the agreed number of the radio links obtained as a result of the negotiation;

the numbers of the PPP frame memory means and the RLP frame memory means being determined in response to the agreed number of the radio links.

9. A mobile station comprising the interworking apparatus claimed in claim 8.

10. An interworking apparatus for use in carrying out conversion of Digital cellular method and IP protocol so as to mutually connect between a mobile station and an IP terminal, comprising:

an IP protocol interface for carrying out IP protocol interface processing to produce IP packets;

an radio interface for carrying out radio protocol interface processing;

a framing portion responsive to the IP packets sent from the IP protocol interface for framing the IP packets into PPP frames;

a reception frame control portion for assigning the PPP frames framed by the framing portion at every one of radio links;

a plurality of PPP frame memories for storing the PPP frames sent from the framing portion, at every one of the radio links;

a plurality of RLP converting portions, which correspond to the respective PPP frame memories, for converting the PPP frames read out of the PPP frame memories into RLP frames, respectively;

a plurality of frame transmission portions, which correspond to the respective RLP converting means, for transmitting the RLP frames sent from the RLP converting means to radio transmission paths through the radio interface;

a plurality of frame reception portions, supplied with RLP frames sent through the radio links, for distributing the RLP frames at every one of radio links;

a plurality of RLP frame memories for successively storing the RLP frames sent from the frame reception portions;

a transmission frame control portion for successively reading the RLP frames out of the RLP frame memories;

a reproducing portion for reproducing the RLP frames read out of the RLP frame memories into PPP frames to supply IP packets to the IP protocol interface by converting the PPP frames into the IP packets on detection of the IP protocol frames;

the reception frame control portion and the transmission frame control portion being given the numbers of the radio links which are determined in relation to a forward direction from the interworking apparatus to the mobile station and a reverse direction from the mobile station to the interworking apparatus;

the reception and the transmission frame control portions varying available numbers of the PPP frame memories and the RLP frame

memories with reference to the numbers of the radio links.

11. An interworking apparatus as claimed in claim 10, wherein the transmission frame control portion processes frames read out of the RLP frame memories when the frames read out of the RLP frame memories are PPP link control frames.

12. A communication system for use in connecting a mobile station through an interworking apparatus to a packet terminal included in a connectionless network, the interworking apparatus comprising:

a first group of frame memories for storing PPP frames produced from reception packets at every one of radio links;

means for reading the PPP frames read out of the first group of the frame memories to convert the PPP frames into radio frames and to produce the radio frames through the radio links, respectively;

a second group of frame memories for storing radio frames sent through radio links at every one of the radio frames; and

reproducing means for reproducing the radio frames read out of the second group of the frame memories into PPP frames.

13. A method of establishing a connection between a mobile station and a terminal of a connectionless network through an interworking apparatus, comprising the steps of:

providing multiplexed radio links between the mobile station and the interworking apparatus;

successively storing radio frames sent through the radio links in those RLP frame memories of the interworking apparatus which are determined for every one of the radio links;

successively reproducing the radio frames into PPP frames; and

delivering PPP frames sent from the terminal to PPP frame memories located at every one of the radio links to convert the PPP frames into radio frames and to produce the radio frames through the

radio links, respectively.

14. An interworking apparatus operable in accordance with a radio communication protocol which defines use of a plurality of radio channels variable in number and another protocol different from the radio communication protocol, comprising:

framing means for framing frames on an upper layer on the basis of another protocol;

memory means for individually and separately storing each of the frames one by one in correspondence with the plurality of the radio channels, respectively; and

transmitting means for transmitting the stored frames through the respective radio channels.

15. An interworking apparatus as claimed in claim 14, wherein the frames on the upper layer are PPP frames defined by the PPP.